

AMENDMENTS TO THE CLAIMS

The following listing of claims replaces all prior versions of the claims and all prior listings of the claims in the present application.

1-7. (canceled)

8. (currently amended) A multiplier, comprising:

a Booth recoder;

a partial product synch register;

a modulus recoder; [[and]]

a multiple modulus synch register; and

a Booth AND gate;

wherein an input to the partial product synch register is at least one output from the Booth recoder,

wherein an input to the multiple modulus synch register is at least one output from the modulus recoder, [[and]]

wherein the partial product synch register and the multiple modulus synch register are used to synchronize signals derived from the at least one output of the Booth recoder and the at least one output of the modulus recoder, and

wherein at least one value from the partial product synch register is input to the Booth AND gate.

9. (canceled)

10. (previously presented) The multiplier of claim 8, further comprising:
a modulus AND gate;

wherein at least one value from the multiple modulus synch register is
input to the modulus AND gate.

11. (currently amended) A multiplier, comprising:

a modulus recoder;

a modulus feedback register;

a Booth recoder; [[and]]

a Booth register; and

a Booth AND gate;

wherein an input to the modulus feedback register is at least one output
from the modulus recoder,

wherein an input to the Booth register is at least one output from the
Booth recoder, [[and]]

wherein the modulus feedback register and the Booth register save
values enabling decreased computation power usage in the multiplier, and

wherein at least one value from the Booth register is input to the Booth
AND gate.

12. (previously presented) The multiplier of claim 11, wherein the Booth register is a feedback register that stores at least one output value of the Booth recoder to be fed back to the Booth recoder.

13. (previously presented) The multiplier of claim 12, wherein the at least one output value is a partial product selection signal, and
wherein the partial product selection signal is used to select a partial product value.

14. (previously presented) The multiplier of claim 11, wherein the Booth register is a pipeline register, and
wherein the pipeline register stores output values of the Booth recoder.

15. (original) The multiplier of claim 11, wherein the modulus feedback register stores at least one output value of the modulus recoder to be fed back to the modulus recoder.

16. (previously presented) The multiplier of claim 15, wherein the at least one output value is a multiple modulus selection signal, and
wherein the multiple modulus selection signal is used to select a multiple modulus value.

17. (canceled)

18. (previously presented) The multiplier of claim 11, further comprising:

a modulus AND gate;

wherein at least one value from the modulus feedback register is input to the modulus AND gate.

19. (currently amended) A partial product generator, comprising:

a Booth recoder; [[and]]

a mux; and

a Booth AND gate;

wherein the mux inputs at least one output from the Booth recoder, [[and]]

wherein the Booth recoder and the mux are used to obtain a partial product, and

wherein at least one value from the mux is input to the Booth AND gate.

20. (canceled)

21. (previously presented) The partial product generator of claim 19, wherein the Booth recoder generates a partial product selection signal and a bit pattern is assigned to any value of the partial product selection signal that is prohibited based on a previous value of the partial product selection signal.

22. (previously presented) The partial product generator of claim 21, wherein the bit pattern is chosen so that a Hamming distance between a current value of the partial product selection signal and the previous value of the partial product selection signal is reduced.

23. (previously presented) The partial product generator of claim 21, wherein the bit pattern is chosen so that an average temporal Hamming distance between the current values of the partial product selection signal and corresponding previous values of the partial product selection signal are reduced.

24. (previously presented) The partial product generator of claim 21, wherein the Booth recoder comprises:

a first mux; and

a second mux;

wherein the first mux inputs a first portion of the previous value of the partial product selection signal and outputs a first portion of a current partial product selection signal, and

wherein the second mux inputs a second portion of the previous value of the partial product selection signal and outputs a second portion of the current partial product selection signal.

25. (original) The partial product generator of claim 24, wherein the first mux and the second mux are 8:1 muxs.

26. (currently amended) A multiple modulus generator, comprising:
a modulus recoder; and
a first mux;

wherein if an enabling signal does not have a predetermined value, the modulus recoder generates a current multiple modulus selection signal,

wherein if the enabling signal does have the predetermined value, a previous value of a multiple modulus selection signal is used without generating the current multiple modulus selection signal, and

wherein the current multiple modulus selection signal or the previous value of the multiple modulus selection signal is used to select a multiple modulus value,

wherein the modulus recoder comprises:

a second mux; and

a third mux;

wherein the second mux inputs a first portion of the previous value of the multiple modulus selection signal and outputs a first portion of the current multiple modulus selection signal, and

wherein the third mux inputs a second portion of the previous value of the multiple modulus selection signal and outputs a second portion of the current multiple modulus selection signal.

27. (currently amended) The multiple modulus generator of claim 26, further comprising:

a modulus AND gate;

wherein at least one value from the first mux is input to the modulus AND gate.

28. (canceled)

29. (currently amended) The multiple modulus generator of claim 26 ~~[[28]]~~, wherein the ~~[[first]]~~ second mux and the ~~second~~ third mux are 8:1 muxs.

30. (currently amended) A multiplier, comprising:

a modulus recoder;

a modulus feedback register;

a modulus synch register;

a Booth recoder;

a Booth synch register; [[and]]

a Booth register; and

a Booth AND gate;

wherein an input to the modulus feedback register is at least one first output from the modulus recoder,

wherein an input to the modulus synch register is at least one second output from the modulus recoder,

wherein an input to the Booth synch register is at least one first output from the Booth recoder,

wherein an input to the Booth register is at least one second output from the Booth recoder,

wherein the modulus feedback register and the Booth register save values enabling decreased computation power usage in the multiplier, [[and]]

wherein the Booth synch register and the modulus synch register are used to synchronize signals derived from the outputs of the Booth recoder and the modulus recoder to decrease glitches, and

wherein at least one value from the Booth sync register is input to the Booth AND gate.

31. (previously presented) The multiplier of claim 30, wherein the Booth register is a feedback register that stores the at least one second output of the Booth recoder to be fed back to the Booth recoder.

32. (previously presented) The multiplier of claim 31, wherein the at least one second output is a partial product selection signal, and
wherein the partial product selection signal is used to select a partial product value.

33. (previously presented) The multiplier of claim 30, wherein the Booth register is a pipeline register, and
wherein the pipeline register stores output values of the Booth recoder.

34. (previously presented) The multiplier of claim 30, wherein the modulus feedback register stores the at least one first output of the modulus recoder to be fed back to the modulus recoder.

35. (previously presented) The multiplier of claim 34, wherein the at least one first output is a multiple modulus selection signal, and
wherein the multiple modulus selection signal is used to select a multiple modulus value.

36. (canceled)

37. (previously presented) The multiplier of claim 30, further comprising:

a modulus AND gate;

wherein at least one value from the modulus sync register is input to the modulus AND gate.

38. (previously presented) The multiplier of claim 30, wherein a multiple modulus value and a partial product value are synchronized by using values from the modulus synch register and values from the Booth synch register.

39. (withdrawn) A method of increasing computation speed of a radix 2^N Montgomery multiplication, where $N \geq 1$, comprising:

providing inputs to a Booth recoder;

storing outputs of the Booth recoder; and

accumulating a result of the Montgomery multiplication;

wherein the storing and the accumulating are performed overlapped in time.

40. (withdrawn) The method of claim 39, wherein the outputs of the Booth recoder are stored in a pipeline register.

41. (withdrawn) A method of reducing power consumption of a radix 2^N Montgomery multiplication, where $N \geq 1$, comprising:
receiving a modulus, multiplier, and multiplicand;
synchronizing values related to the modulus, multiplier, and
multiplicand; and
accumulating the values to produce a result of the Montgomery
multiplication.

42. (withdrawn) The method of claim 41, further comprising:
calculating a multiple modulus using at least one of the modulus,
multiplier, and multiplicand; and
calculating a partial product using at least one of the modulus,
multiplier, and multiplicand;
wherein the multiple modulus and the partial product are the
synchronized values.

43. (withdrawn) The method of claim 41, wherein synchronizing values
comprises:
storing at least two inputs related to the modulus, multiplier, and
multiplicand in synchronization registers.

44. (withdrawn) The method of claim 42, further comprising:
matching an arrival time of the multiple modulus and the partial product
to an accumulator; and
reducing overall power consumption of the Montgomery multiplication.

45. (withdrawn) A method of reducing power consumption of a radix 2^N
Montgomery multiplication, where $N \geq 1$, comprising:
providing inputs to a Booth recoder;
producing a selection signal using the Booth recoder;
assigning an inverted bit pattern to any value of the selection signal that
is prohibited based on a previous value of the selection signal; and
storing outputs of the Booth recoder.

46. (withdrawn) The method of claim 45, further comprising:
choosing the inverted bit pattern so that a Hamming distance between a
current value of the selection signal and the previous value of the selection
signal is minimized.

47. (withdrawn) The method of claim 45, wherein the inverted bit
pattern is chosen so that an average temporal Hamming distance between
current values of the selection signal and corresponding previous values of the
selection signal are minimized.

48. (withdrawn) A method of reducing power consumption of a radix 2^N Montgomery multiplication, where $N \geq 1$, comprising:

- determining an nth value of an iterative result signal;
- providing an enable signal and the nth value of the iterative result signal to a circuit;
- if the enable signal renders an (n+1)th value of the iterative result signal meaningless, then not calculating the (n+1)th value of the iterative result signal;
- feeding back the nth value of the iterative result signal; and
- using the nth value of the iterative result signal instead of the (n+1)th value of the iterative result signal.

49. (withdrawn) The method of claim 48, wherein the nth and (n+1)th values of the iterative result signal are determined by combinational logic.

50. (withdrawn) The method of claim 49, wherein the combinational logic is performed by a mux.

51. (withdrawn) A method of reducing power consumption of a modulus recoder, comprising:

- determining an nth value of a multiple modulus selection signal;

storing the n th value of the multiple modulus selection signal in a register;

generating an $(n+1)$ th enable signal; and

using the n th value of the multiple modulus selection signal without determining an $(n+1)$ th value of the multiple modulus selection signal if a value of the $(n+1)$ th enable signal is a predetermined value;

wherein the predetermined value of the enable signal selects a multiple modulus value of zero.

52. (withdrawn) The method of claim 51, further comprising:

selecting the multiple modulus value using the multiple modulus selection signal;

wherein selecting the multiple modulus value is not performed when the value of the enable signal is the predetermined value.

53. (currently amended) A Montgomery multiplier, comprising:

means for inputting, wherein the means for inputting enters values for a modulus, multiplicand, and a multiplier;

means for Booth storing, wherein the means for Booth storing stores at least one output value from a Booth recoder;

means for modulus storing, wherein the means for modulus storing stores at least one output value from a modulus recoder;

means for partial product generation, wherein the means for partial product generation produces a partial product value using input from the means for input;

means for multiple modulus generation, wherein the means for multiple modulus generation produces a multiple modulus value using the input from the means for input;

means for synchronizing, wherein the means for synchronizing synchronizes the partial product value and multiple modulus value; and

means for accumulating, wherein the means for accumulating inputs the synchronized partial product value and multiple modulus value and produces a result for the Montgomery multiplier;

wherein the means for synchronizing includes a Booth AND gate and a modulus AND gate.